Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

0058192

OCT 30 2002

03-WMD-0028

Ms. Jane A. Hedges
Cleanup Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
1315 W. Fourth Avenue
Kennewick, Washington 99336

Dear Ms. Hedges:

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FINAL STATUS CORRECTIVE ACTION SEMI-ANNUAL REPORTS FOR APRIL THROUGH JUNE 2002

Semi-annual reports for two RCRA sites, where groundwater is monitored under Final Status/Corrective Action programs, are attached. The reports are the 183-H Solar Evaporation Basins and the 300 Area Process Trenches. These reports are submitted to fulfill the requirements of WAC 73-303-645(11)(g).

If you have questions, please contact M. J. Furman, Waste Management Division, on (509) 373-9630.

Sincerely,

John G. Morse, Program Manager
Groundwater Protection Program

WMD:MJF

Attachments

cc w/attachs:
Administrative Record

cc w/o attachs:
R. L. Biggerstaff, FHI
J. V. Borghese, FHI
M. J. Hartman, FHI
R. J. Landon, BHI
J. W. Lindberg, PNNL
S. P. Luttrell, PNNL
A. G. Mishko, FHI

Results of Groundwater Monitoring for the 183-H Solar Evaporation Basins

Reporting Period: January - June 2002
Report Date: October 2002

M.J. Hartman

INTRODUCTION

The 183-H solar evaporation basins were located in the 100 H Area of the Hanford Site, and have been demolished and backfilled. The basins are a treatment, storage, or disposal unit under the *Resource Conservation and Recovery Act of 1976* (RCRA) in the Hanford Facility RCRA Permit (Ecology 1994). Groundwater is monitored in accordance with Washington Administrative Code (WAC) 173-303-645(11), Corrective Action Program, and Part VI, Chapter 2 of the Hanford Facility RCRA Permit (Ecology 1994). The waste discharged to the basins originated in the 300 Area fuel fabrication facility and included solutions of chromic, hydrofluoric, nitric, and sulfuric acids that had been neutralized. The waste solutions contained various metallic and radioactive constituents (e.g., chromium, technetium-99, uranium). Between 1985 and 1996, remaining waste was removed, the facility was demolished, and the underlying contaminated soil was removed and replaced with clean fill.

This is one of a series of reports on corrective action monitoring at the 183-H basins. It addresses requirement of WAC 173-303-645(11)(g) to report twice each year on the effectiveness of the corrective action program. This report covers the period from January through June 2002.

The Washington State Department of Ecology issued the Hanford Facility RCRA Permit in 1994 (Ecology 1994). The 183-H basins were initially included in Part V of the Permit, which contains requirements specifically applicable to those treatment, storage, and disposal units that are undergoing closure. A final-status, compliance monitoring program was proposed in 1995 (Hartman and Chou, 1995) to comply with the groundwater monitoring requirements of WAC 173-303-645(10). The first sample set collected during the compliance monitoring program showed that downgradient concentrations of the contaminants of interest exceeded concentration limits defined in the monitoring plan. The regulations in WAC 173-303-645(11) require corrective action activities to reduce contaminant concentrations in groundwater. The postclosure plan (DOE-RL 1997a), which was incorporated into Part VI of the Hanford Facility RCRA Permit in February 1998, deferred further actions at the 183-H basins to the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) interim action for the 100-HR-3 Operable Unit. The postclosure plan also required monitoring to be conducted as described in the revised final status RCRA groundwater monitoring plan (Hartman 1997). That plan included four contaminants of interest for groundwater: chromium, nitrate, technetium-99, and uranium. Of these, only chromium is a listed dangerous waste

constituent subject to regulation under RCRA. However, all four constituents continue to be monitored because they are included by reference in the Hanford Facility RCRA Permit.

The objective of RCRA groundwater monitoring at the 183-H basins during the period of interim remediation is to track trends in chromium, nitrate, uranium, technetium-99, and fluoride. DOE, the regulators, and members of the public will determine methods for final remediation of 100-H Area groundwater some time in the future. At that time, the RCRA groundwater monitoring program will be revised to meet the requirements of final remedial measures.

INTERIM REMEDIAL MEASURE

The interim remedial measure applies to the 100-HR-3 groundwater operable unit, which is under the authority of a CERCLA record of decision. Groundwater is pumped from five extraction wells, located west, north, and east of the 183-H Basins (Figure 1). The effluent is treated to remove chromium and injected back into the aquifer in upgradient wells. The objective of the interim remedial measure is to reduce the amount of chromium entering the Columbia River, where it is a potential hazard to the ecosystem.

Groundwater is sampled to monitor the effectiveness of the interim remedial measure and to monitor the entire 100-HR-3 Operable Unit (DOE-RL 1997b). This CERCLA monitoring is coordinated with RCRA monitoring.

The pump-and-treat system may be shut down when concentrations of hexavalent chromium are below 22 µg/L in wells specified in the record of decision, and data indicate that the concentration will remain below that value. The system may also be shut down if the system proves ineffective or if a better treatment technique is found. The most recent operable unit report, covering calendar year 2001, concluded that chromium concentrations in groundwater were declining but are not consistently below 22 µg/L in compliance wells (DOE-RL 2002).

RCRA GROUNDWATER MONITORING PROGRAM

Four wells located in the 183-H chromium plume are monitored for corrective action program requirements during pump-and-treat activities (see Figure 1). Three of the wells are completed at the top of the uppermost aquifer (Hanford formation): wells 199-H4-7 and 199-H4-12A are extraction wells, and well 199-H4-3 is a monitoring well that has historically shown the highest levels of chromium, nitrate, technetium-99, and uranium from the 183-H basins. Well 199-H4-12C is located adjacent to 199-H4-12A and is completed in a confined aquifer in the Ringold Formation. This well consistently has elevated concentrations of chromium without 183-H co-contaminants. The source of chromium in well 199-H4-12C is unknown.

Wells are sampled annually for RCRA, generally in November. This is typically a period when river stage is low and the samples reflect nearly pure groundwater instead of a

mixture of groundwater and river water held in bank storage. Therefore, contaminant concentrations in November are usually among the highest of the year.

Hartman and Chou (1995) listed the following concentration limits for the 183-H Basins constituents of interest:

- Chromium: 122 µg/L. This limit represents background concentrations and was based on data from upgradient wells 199-H3-2A and 199-H4-6, which were formerly monitored for RCRA.

- Nitrate: 45 mg/L (as NO_3). Based on final maximum contaminant level (56 FR, January 30, 1991).

- Uranium: 20 µg/L. Based on EPA guidance in effect at the time the plan was written.

- Technetium-99: 900 pCi/L. Interim drinking-water standard, based on national primary drinking water standards (40 CFR 141).

Hartman and Chou (1995) did not identify fluoride as a groundwater contaminant of interest, but it was detected in the vadose zone beneath the former basins and so it is monitored under RCRA (DOE-RL, 1997a).

During the period of compliance monitoring (1995-1996), contaminant concentrations from compliance wells were compared to the concentration limits listed above to determine whether corrective action was necessary as required under WAC 173-303-645. Because the CERCLA pump-and-treat system is not the final corrective action for the site, the current objective of RCRA monitoring is simply to track trends, not to determine the effectiveness of the corrective action (Hartman 1997). After completion of the interim remedial measure and future phases of corrective action, the RCRA monitoring program will be revised.

CONTAMINANT TRENDS

This section discusses concentrations of chromium, nitrate, technetium-99, and uranium in groundwater. The four wells in the RCRA network were not sampled specifically for RCRA during the reporting period. The RCRA network includes two of the pump-and-treat extraction wells, which were sampled for CERCLA objectives during the reporting period; these samples were not analyzed for fluoride. All available data are presented in Table 1 and pertinent results are discussed below.

Concentrations of groundwater contaminants fluctuate seasonally, especially in wells 199-H4-3 and 199-H4-12A. These two wells are directly in the contaminant plume from the 183-H basins and are relatively near the Columbia River. Changing river stage causes the water table to rise and fall. In general, a low water table is associated with higher concentrations of contaminants. However, in 1996-1997 river stage was above

average and contaminant concentrations rose. The higher water table may be mobilized contaminants from the vadose zone, causing increases in concentrations. Since 1998, overall contaminant trends have been downward.

Chromium

Chromium data may include two types of analyses: total chromium (analyzed with the inductively coupled plasma method) and hexavalent chromium. Total chromium measured in unfiltered samples may include the relatively insoluble, nontoxic trivalent chromium as well as the soluble, more toxic hexavalent form. Filtered samples represent dissolved chromium, which is hexavalent. Samples analyzed specifically for hexavalent chromium may be filtered or unfiltered. During the reporting period, all samples were unfiltered and analyzed for hexavalent chromium (Table 1).

New chromium data were available for extraction wells 199-H4-12A and 199-H4-7 (Figure 2). Concentrations in well 199-H4-12A have declined since January 2001. The highest value of dissolved chromium in this well during the reporting period was 45 μg/L, which is below the concentration limit for 183-H (122 μg/L) and below the maximum contaminant level (100 μg/L).

Chromium concentrations in extraction well 199-H4-7 had been declining since 1998. However, the concentration increased slightly during the reporting period. The highest concentration was 36 μg/L in May 2002, compared to 29 μg/L in November 2001. Nitrate and technetium-99 also increased in this well in May 2002. The cause of these increases, and more dramatic increases in 1997, is unknown. They may relate to changing flow directions due to a rising river stage or groundwater extraction. Alternatively, the increases may have been caused by mobilization of contaminants from the vadose zone when the water table was high.

Nitrate

Nitrate concentrations decreased in well 199-H4-12A and increased slightly in well 199-H4-7 (Figure 3). The highest concentration was in well 199-H4-7, at 65 mg/L in May 2002, exceeding the maximum contaminant level (45 mg/L). This was the highest level of nitrate in this well since a spike in July 1997 that appears to have been related to similar increases in uranium and technetium-99.

Technetium-99

In May 2002, technetium-99 concentrations decreased to undetected in well 199-H4-12A and increased to 123 pCi/L in well 199-H4-7 (Figure 4). Both values were below the 900-pCi/L drinking water standard. The increase in well 199-H4-7 was the first potentially significant increase in the well since a spike in July 1997, and corresponds to increases in chromium and nitrate.

Uranium

Uranium concentrations continued to be low in both of the wells sampled during the reporting period (Figure 5), ranging from 2 to 4 µg/L. The concentration decreased in well 199-H4-12A and remained stable in well 199-H4-7.

CONCLUSIONS

The current objective of RCRA corrective action monitoring is simply to track trends, not to determine the effectiveness of the interim remedial action. After completion of the interim remedial measure and future phases of corrective action, the RCRA groundwater monitoring program will be revised.

Concentrations of chromium, nitrate, and technetium-99 rose slightly in extraction well 199-H4-7 since the last reporting period. The increase is orders of magnitude smaller than spikes in contaminant concentrations in 1997, but the groundwater project will continue to monitor trends.

The four RCRA wells will be sampled for all of the constituents of interest in November 2002. The current RCRA monitoring plan (Hartman 1997) remains adequate for the objective of tracking trends during the period of the interim remedial action.

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DOE-RL, 1997a, *183-H Solar Evaporation Basins Post-Closure Plan*, DOE/RL-97-48, Rev. 0, U.S. Department of Energy, Richland, Washington.

DOE-RL, 1997b, *Interim Action Monitoring Plan for the 100-HR-3 and 100-KR-4 Operable Units*, DOE/RL-96-90, U.S. Department of Energy, Richland, Washington.

Ecology, 1994, *Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste*, Permit No. WA7890008967, effective September 28, 1994, Washington State Department of Ecology, Olympia, Washington.

Hartman, M.J. and C.J. Chou, 1995, *Groundwater Monitoring Plan for the 183-H Solar Evaporation Basins*, WHC-SD-EN-AP-180, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Hartman, M.J., 1997. *Groundwater Monitoring Plan for the 183-H Solar Evaporation Basins*, PNNL-11573, Pacific Northwest National Laboratory, Richland, Washington.

Table 1. Groundwater Monitoring Data for 183-H Basins, January-June 2002[a].

Well	Date	Result	Filtered	Qualifier	Chromium Analysis
Chromium, µg/L					
199-H4-12A	2/11/2002	45	N		Hexavalent
199-H4-12A	5/21/2002	22	N		Hexavalent
199-H4-7	2/11/2002	26	N		Hexavalent
199-H4-7	2/11/2002	29	N		Hexavalent
199-H4-7	2/11/2002	30	N		Hexavalent
199-H4-7	5/21/2002	31	N		Hexavalent
199-H4-7	5/21/2002	36	N		Hexavalent
199-H4-7	5/21/2002	36	N		Hexavalent
Fluoride					
No data for January-June 2002					
Nitrate					
199-H4-12A	5/21/2002	10.8	N		
199-H4-7	5/21/2002	60.7	N		
199-H4-7	5/21/2002	64.6	N		
Technetium-99, pCi/L					
199-H4-12A	5/21/2002	5	N	U	
199-H4-7	5/21/2002	118	N		
199-H4-7	5/21/2002	123	N		
Uranium, µg/L					
199-H4-12A	5/21/2002	2	N		
199-H4-7	5/21/2002	4	N		
199-H4-7	5/21/2002	3	N		

[a] Not sampled specifically for RCRA during this reporting period. These results represent sampling for the 100-HR-3 Operable Unit.

U = value is below detection limit.

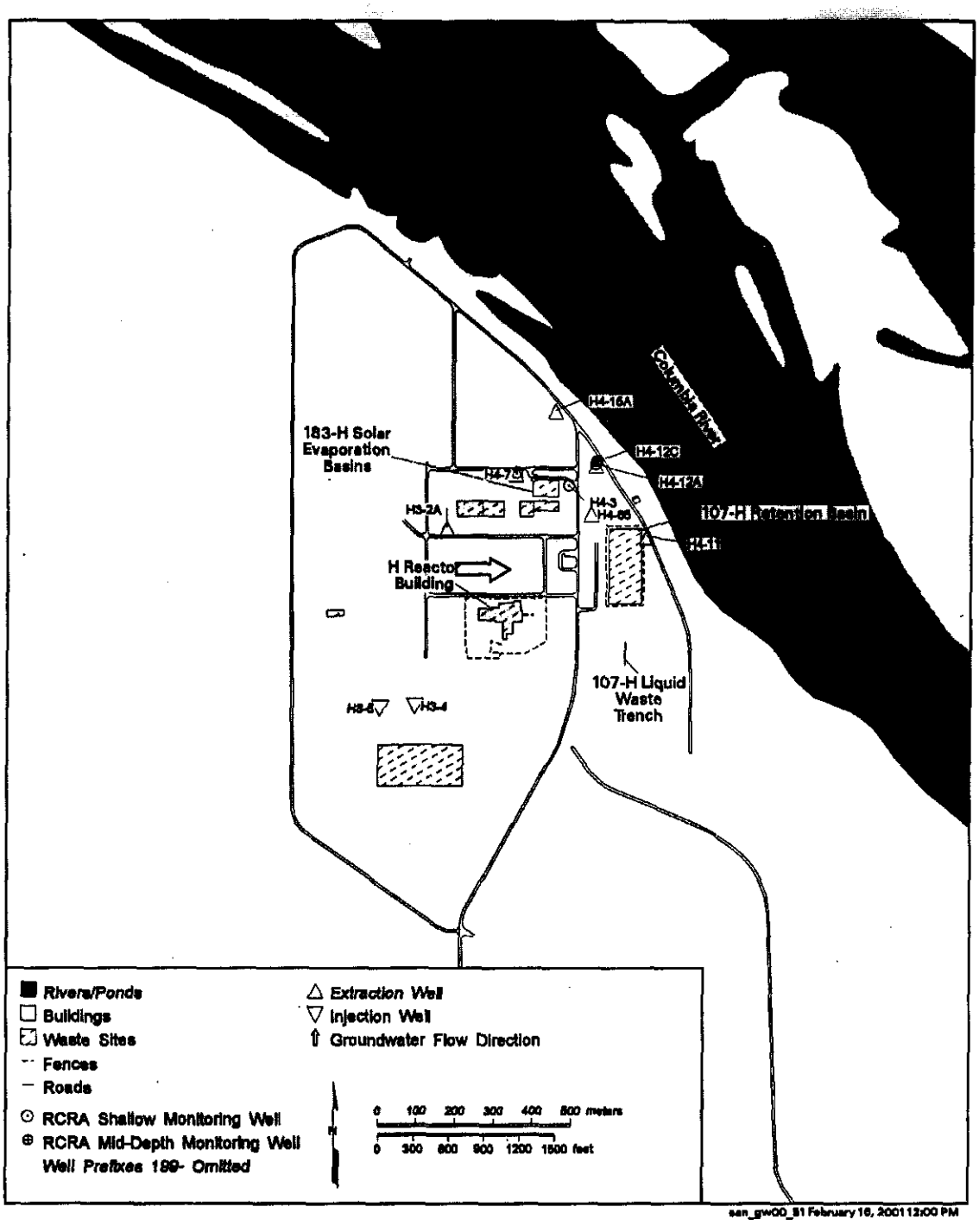

Figure 1. Monitoring Well Locations for 183-H Solar Evaporation Basins.

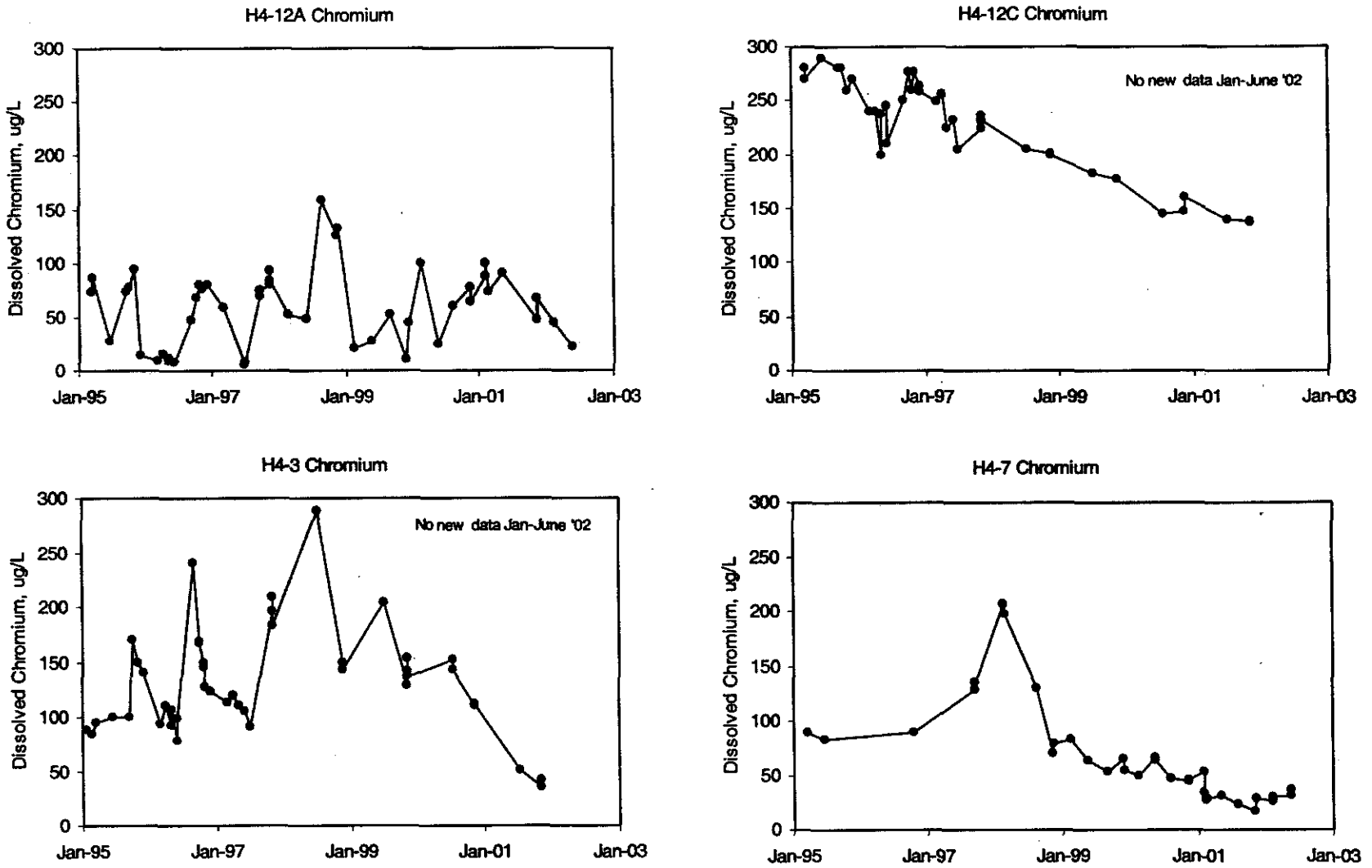

Figure 2. Dissolved Chromium in 183-H Monitoring Wells.

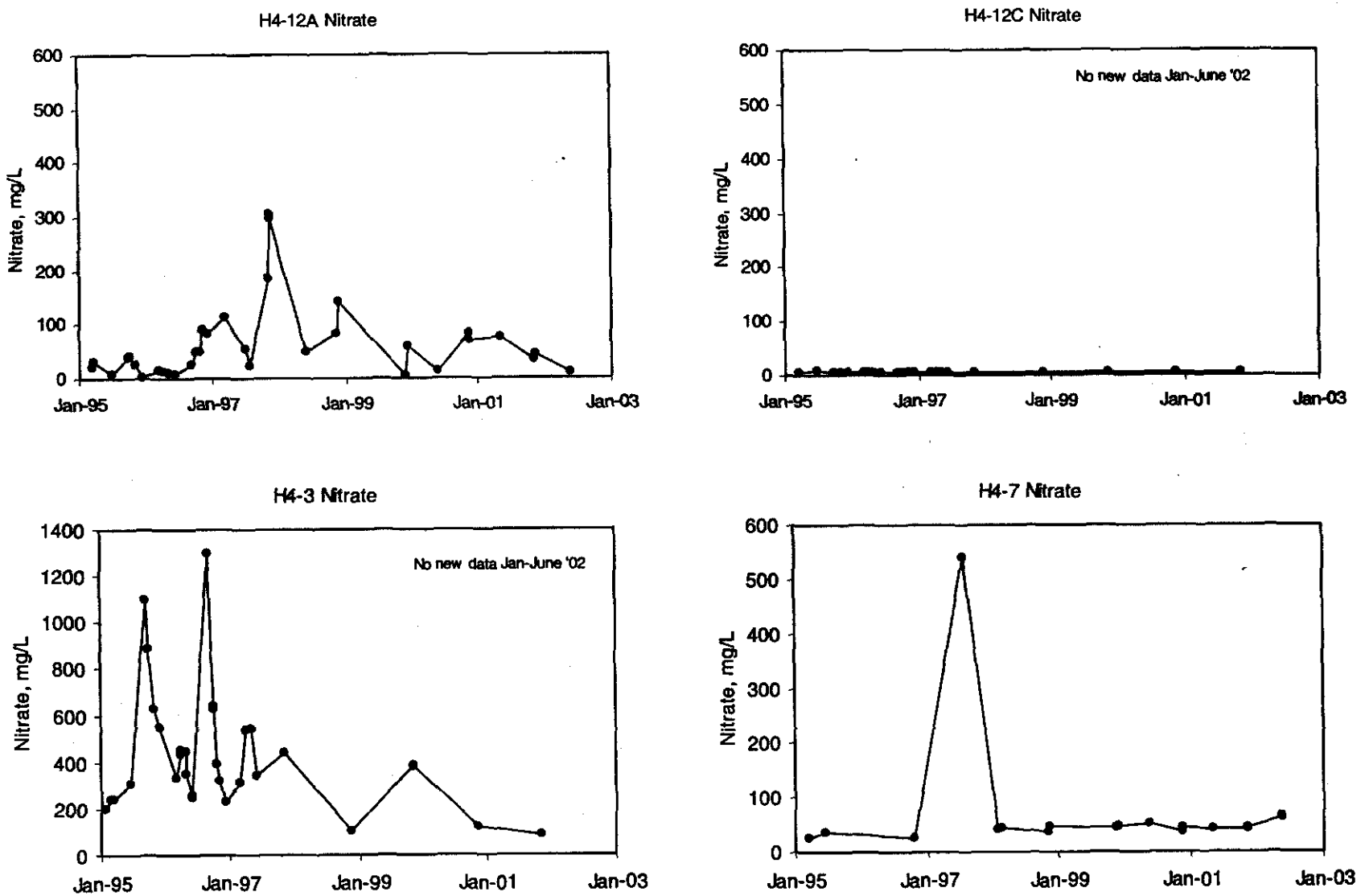

Figure 3. Nitrate in 183-H Monitoring Wells.

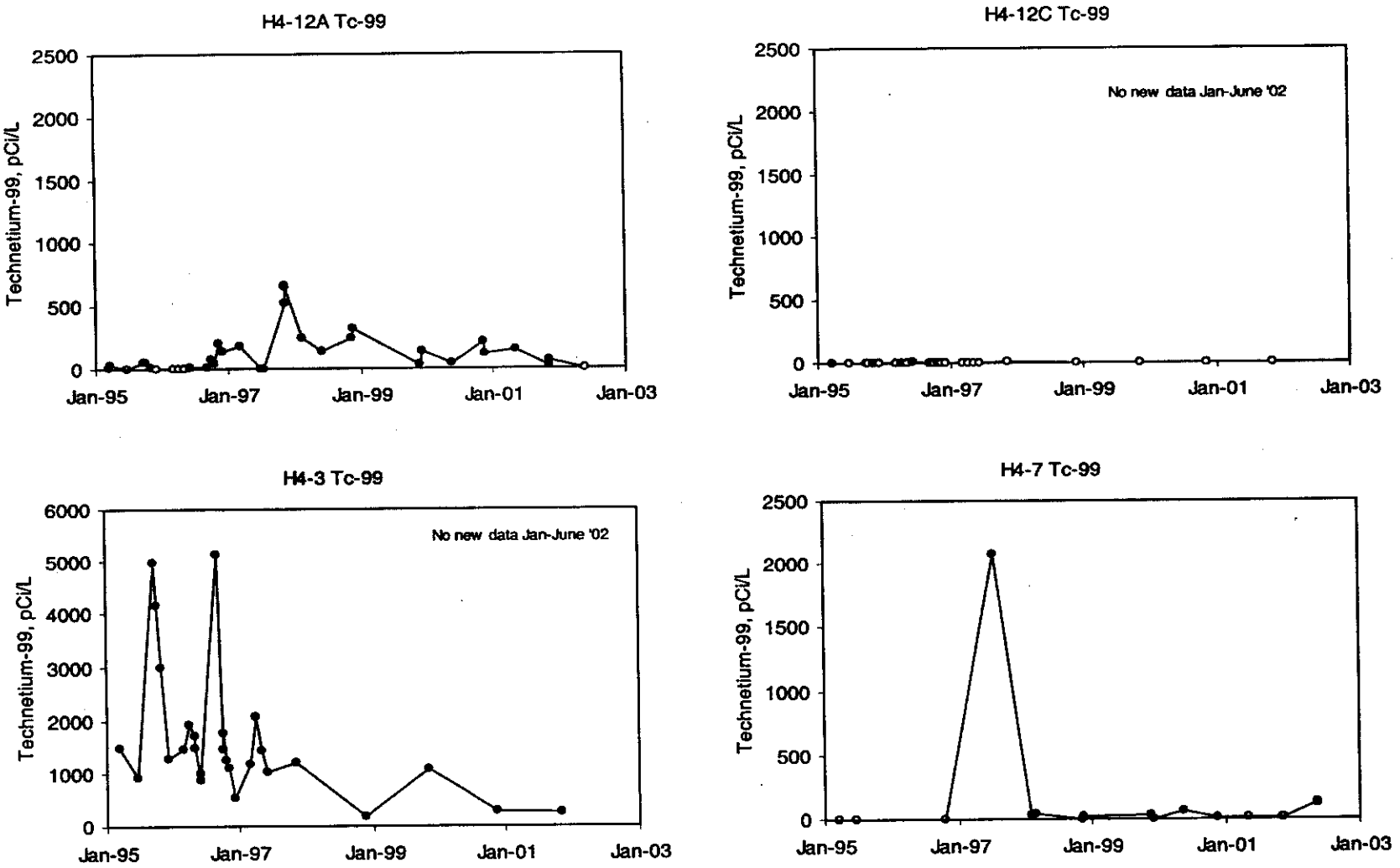

Figure 4. Technetium-99 in 183-H Monitoring Wells.

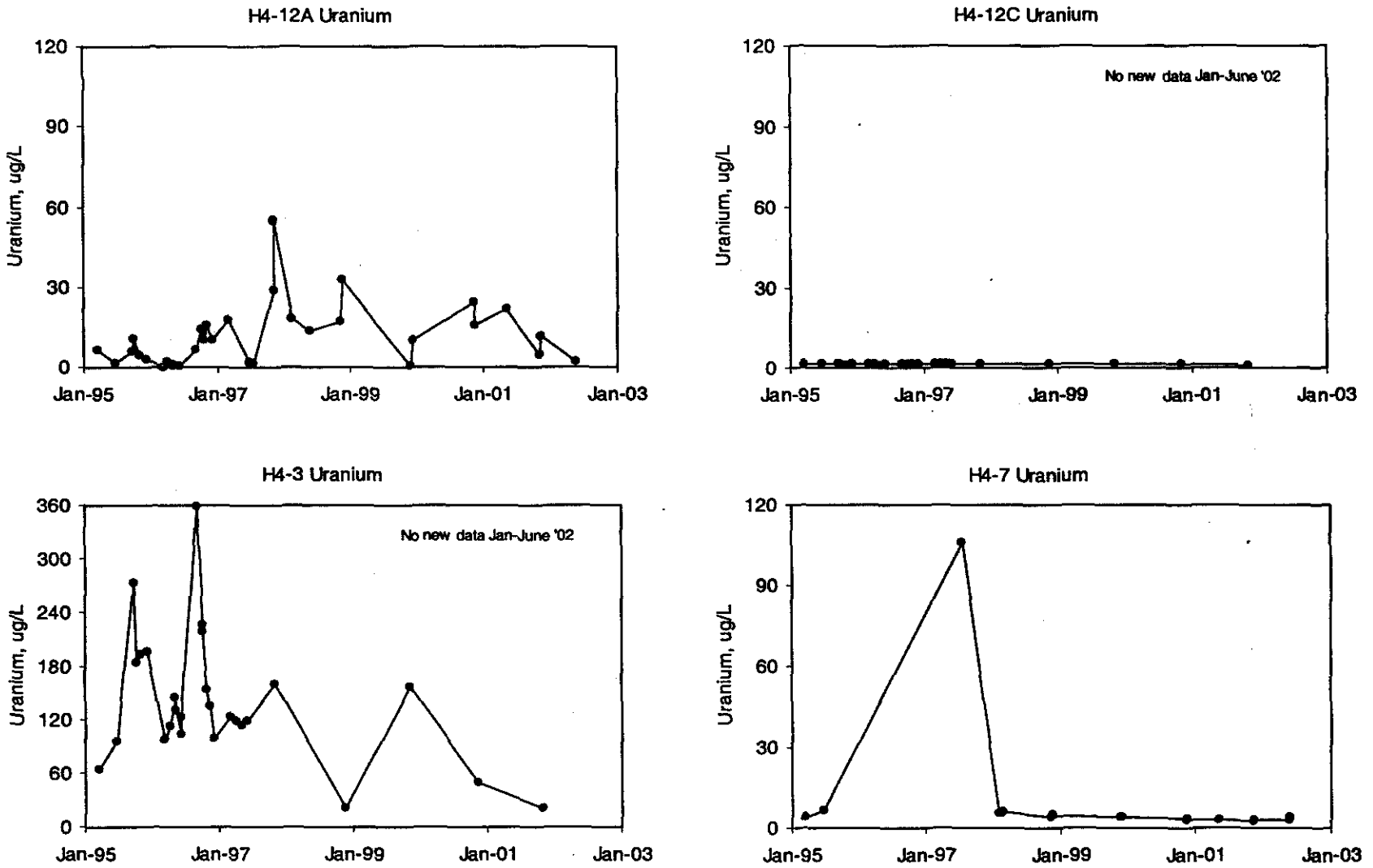

Figure 5. Uranium in 183-H Monitoring Wells.

Results of Groundwater Monitoring for the 300 Area Process Trenches

Reporting Period: January through June 2002
Report Date: October, 2002

J.W. Lindberg

INTRODUCTION

The 300 Area Process Trenches (316-5) are a *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, or disposal unit in the Hanford Facility RCRA Permit (Ecology 1994). From 1975 through 1994 they received effluent discharges of dangerous mixed waste from fuel fabrication laboratories in the 300 Area. The 300 Area Process Trenches (300 APT) groundwater monitoring is conducted in accordance with Washington Administrative Code (WAC) 173-303-645(11), Corrective Action Program, and Part VI, Chapter 1 of the Hanford Facility RCRA Permit (Ecology 1994). This is one of a series of semiannual groundwater-monitoring reports on the corrective action program at the 300 APT. It fulfills requirements of WAC 173-303-645(11)(g) to report on the effectiveness of the corrective action program. Results of monitoring have been reported previously in groundwater annual reports (e.g., Hartman et al. 2001; Hartman et al. 2002). This report covers groundwater-monitoring data collected during the period from January through June 2002.

BACKGROUND

The objective of groundwater monitoring during the corrective action period is to demonstrate the effectiveness of the corrective action program by examining the trend of the constituents of interest to confirm that they are attenuating naturally, as expected by the CERCLA record of decision for the 300-FF-5 Operable Unit (ROD 1996). In September 2001 a new groundwater-monitoring plan (Lindberg and Chou 2001) was implemented. Changes over the previous plan included an update on the discussion of hydrogeology and conceptual model, a change in the number of network wells from 8 to 11 (Figure 1), and a revision of the statistical approach to the control chart method that tracks the contamination trends better than the previous plan with reduced costs.

The 300 APT were closed under a modified closure/post-closure plan (DOE 1994) and continue to be in the groundwater corrective action program because groundwater contamination continues to exceed drinking water standards. Groundwater monitoring will continue for 30 years during the post-closure monitoring period. A new groundwater-monitoring plan (Lindberg and Chou 2001) was submitted to Ecology and was released for public comment in May 2002. The new groundwater-monitoring plan is in effect under a temporary authorization granted by Ecology on February 6, 2002, and continued to June 9, 2002. Ecology extended the temporary authorization in June 2002 and will continue to December 9, 2002. Only two temporary authorizations are allowable, and unless the Hanford Facility RCRA Permit modification is finalized by December 9, 2002, groundwater monitoring at the 300 APT must revert to the previous plan (Lindberg, et al. 1995). The previous plan was a compliance-monitoring plan and was not designed to effectively track the plumes of contaminants of concern over time. It

utilizes a network of fewer wells, but samples the well network eight times per year and is more expensive.

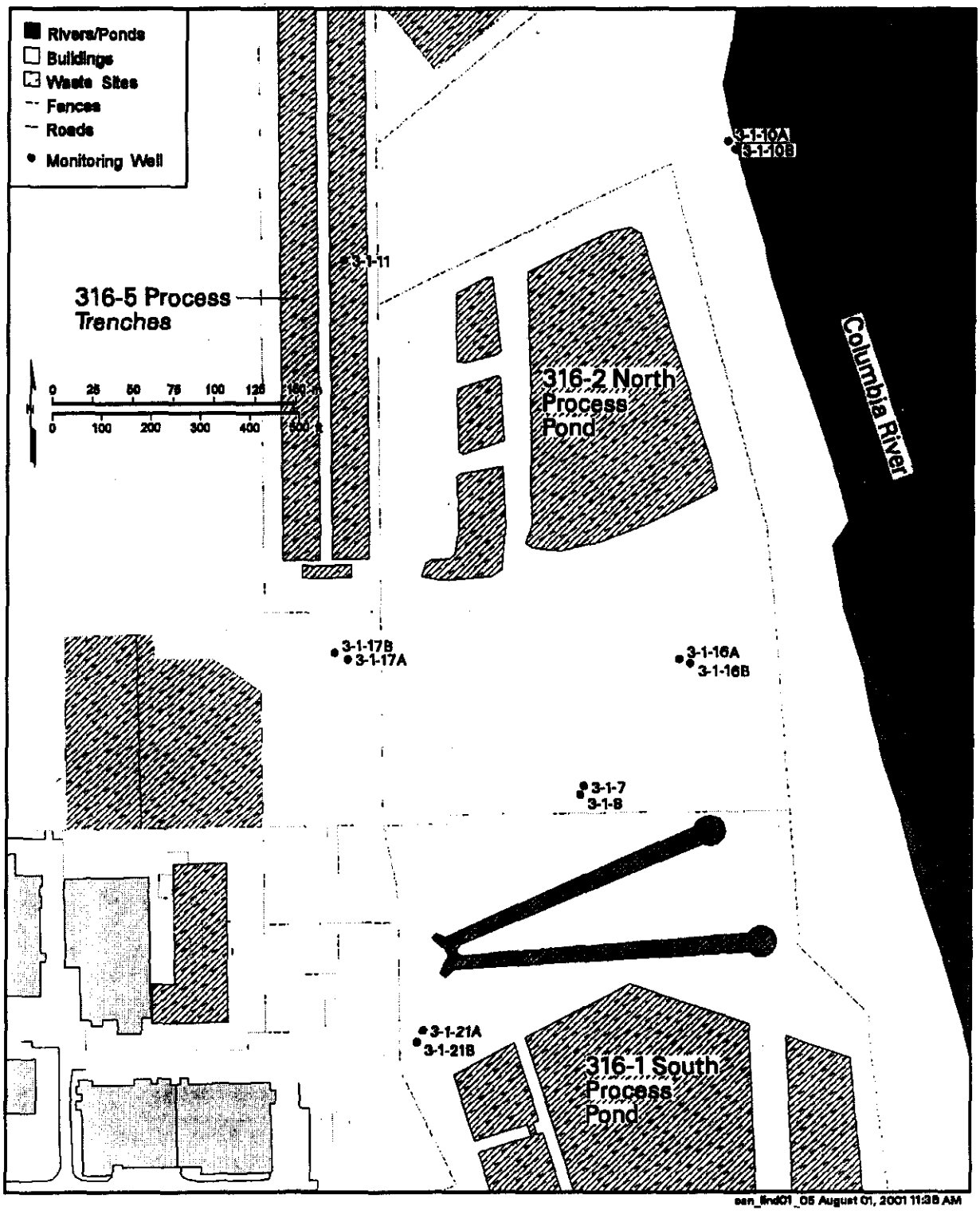

Figure 1. Locations of Wells in the 300 Area Process Trenches Monitoring Network (from PNNL-13645).

The most significant difference between the old and new groundwater-monitoring plans is the change in statistical approach. The new statistical approach is a control chart method that uses a single observation (sample) during any monitoring event rather than four time-independent samples specified by the old plan. The method monitors each well in the network individually and yet maintains desired site-wide false-positive and false-negative rates. Also, each well showing an exceedance of one of the constituents of interest (currently 5 of the 11 network wells) is sampled quarterly to better follow the trends of contaminant concentration. The other wells in the network will continue to be sampled semiannually.

RCRA GROUNDWATER-MONITORING PROGRAM

The revised groundwater-monitoring network for the 300 APT includes five well pairs plus one additional well (399-1-11) at the 300 APT that is screened in the upper portion of the unconfined aquifer (Figure 1). Each of the well pairs has one shallow and one deep well. The shallow wells are screened at the water table, and the deep wells are screened at the bottom of the local unconfined aquifer (above the lacustrine and overbank deposits of the Ringold Formation lower mud unit).

The wells are sampled for the constituents of interest, including total uranium (chemical), and the volatile organic compounds cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene. The maximum contaminant levels (MCLs), as specified in Lindberg and Chou (2001) are shown in Table 1 along with the current method detection levels (MDLs).

Table 1. Maximum Contaminant Levels and Method Detection Levels of 300 APT Constituents of Interest

Constituents of Interest	MCL	MDL
Uranium	30 µg/L	0.1 µg/L
Cis-1,2-dichloroethene	70 µg/L	0.5 µg/L
Trichloroethene	5 µg/L	0.31 µg/L
Tetrachloroethene	5 µg/L	0.36 µg/L

Uranium is not a listed dangerous waste constituent subject to regulation under RCRA. However, since it is included in the groundwater monitoring plan, which is cited in the Hanford Facility RCRA Permit, it will continue to be monitored for in the 300 APT corrective action program.

The sampling schedule is based on the concentrations of the constituents of interest reported at each well. As mentioned in the Background Section, wells with constituents of interest exceeding MCLs are sampled quarterly. The rest are sampled semiannually. Table 2 lists the wells in the 300 APT network, their sampling frequency, and if sampled quarterly, the constituents of interest that exceed drinking water standards.

Table 2. Sampling Schedule for Wells in the 300 APT Network
As Specified In The Groundwater-Monitoring Plan (PNNL-13645)

Well	Sampling Frequency	Constituents of Interest Exceeding MCLs
399-1-7	Quarterly	Uranium
399-1-8	Semiannually	
399-1-10A	Quarterly	Uranium
399-1-10B	Semiannually	
399-1-11	Quarterly	Uranium
399-1-16A	Quarterly	Uranium
399-1-16B	Quarterly	Cis-1,2-dichloroethene
399-1-17A	Quarterly	Uranium
399-1-17B	Semiannually	
399-1-21A	Semiannually	
399-1-21B	Semiannually	

WATER TABLE, GROUNDWATER -FLOW DIRECTIONS, AND RIVERBANK STORAGE

The water table during the March 2002 sampling event was in its normal (low river stage) configuration where it sloped to the southeast in the vicinity of the 300 APT. Therefore, the flow direction was interpreted to be to the southeast as well during that time. However, during June 2002 the Columbia River experienced high river stage during the Spring/Summer runoff that caused a reversed gradient on the water table and bank storage of river water beyond several of the near-shore wells. [Note: A figure depicting the water table is not included because the water levels were measured over an eleven-day period. Water table maps of the 300 Area are easier to interpret when the water level measurements are collected in a relatively short period of time, such as one day. Over an 11-day period the 300 Area can experience multiple river-stage fluctuations.]

The degree of river water/groundwater mixing and the distance from the river that the bank storage extended can be interpreted from the results of measurements of specific conductance. Typically, specific conductance of Columbia River water near the 300 Area is in the range of 120 to 150 uS/cm, whereas groundwater in the upper portion of the unconfined aquifer of the 300 Area typically has a range of 300 to 500 uS/cm. During the June 2002 sampling event, wells 399-1-10A and 399-1-16A (see Figure 1 for well locations) showed substantial decreases in specific conductance over March 2002 measurements (466 to 172 and 458 to 181 uS/cm, respectively) indicating a substantial amount of mixing of river water and groundwater. Well 399-1-17A and 399-1-7 showed a slight drop in specific conductance (468 to 315 and 471 to 259 uS/cm) indicating only a very slight amount of river water/groundwater mixing. Well 399-1-7 showed more mixing, and is closer to the river, than well 399-1-17A. Wells farther away from the river did not show a drop in specific conductance and probably did not experience any mixing with river water.

GROUNDWATER CONTAMINANT TRENDS

This section discusses concentrations of uranium and cis-1,2-dichloroethene (cis-DCE) in groundwater downgradient of the 300 APT starting with the distribution of these contaminants as reported in the last annual groundwater report (Hartman et al. 2002) and continuing through the current reporting period. The distribution of uranium concentration in the 300 Area during the August-September 2001 time period (the same map shown in the latest annual groundwater report) is shown in Figure 2. The plume for cis-DCE (at levels above the MCL) is observed in only one well (399-1-16B). Trichloroethene and tetrachloroethene are not discussed because none of the wells in the network had reported concentrations at or above the MCLs. Since March 1997 the reported concentrations of trichloroethene have been slowly declining or holding steady at low concentrations, and tetrachloroethene is no longer detected in 300 APT network wells. Appendix A contains all reported results for constituents of interest in 300 APT network wells during the current reporting period.

During the current reporting period, the network wells were sampled twice, once in March 2002 and again in June 2002. Only six of the 11 wells were sampling during the March sampling event because the other five wells are on a semiannual sampling schedule

The reported results of the March 2002 sampling event showed that the uranium MCL (30 μg/L) was exceeded in three wells. The exceedances were 67.8 μg/L at well 399-1-6A, 44.7 μg/L at well 399-1-17A, and 58.1 μg/L at 399-1-7. At wells 399-1-10A and 399-1-11 the concentration of uranium had dropped below the MCL. For 399-1-10A the result was 27.4 μg/L, and the previous quarter it was 31.6 μg/L. For 399-1-11 the result was 8.4 μg/L with a result of 9.03 μg/L the previous quarter. Therefore, it was the first quarter that uranium in well 399-1-10A fell below the MCL, but the second quarter uranium in well 399-1-11 was below the MCL. The decision was made to drop well 399-1-11 to a semiannual sampling schedule, but leave 399-1-10A at a quarterly schedule until another set of reported values could confirm that it indeed was below the MCL.

The reported results for uranium from the June 2002 sampling event showed the effects of the high river stage that was occurring at the same time. Changes to the uranium plume were similar to the changes that occurred in specific conductance in wells near the river. That is, in areas where there was substantial mixing of groundwater with river water there was a corresponding decrease in uranium concentration (wells 399-1-10A, Figure 3; and 399-1-16A, Figure 4). However, in areas where there was partial mixing, there was either a slight decrease in uranium concentration (399-1-7, Figure 5) or a slight rise in uranium concentration (399-1-17A, Figure 6). In areas where there was little or no mixing of groundwater with river water, the concentration of uranium increased (wells 399-1-11, Figure 7; and 399-1-21A, Figure 8). Figure 9 shows the locations of 300 APT network wells (and other wells sampled for uranium and specific conductance, including 300-FF-5 and Surveillance wells sampled at the same time) and the net increase or decrease in uranium concentration over the previous measurement. The wells closer to the river tend to have a net decrease in uranium concentration, whereas wells further away show net increases in uranium concentration.

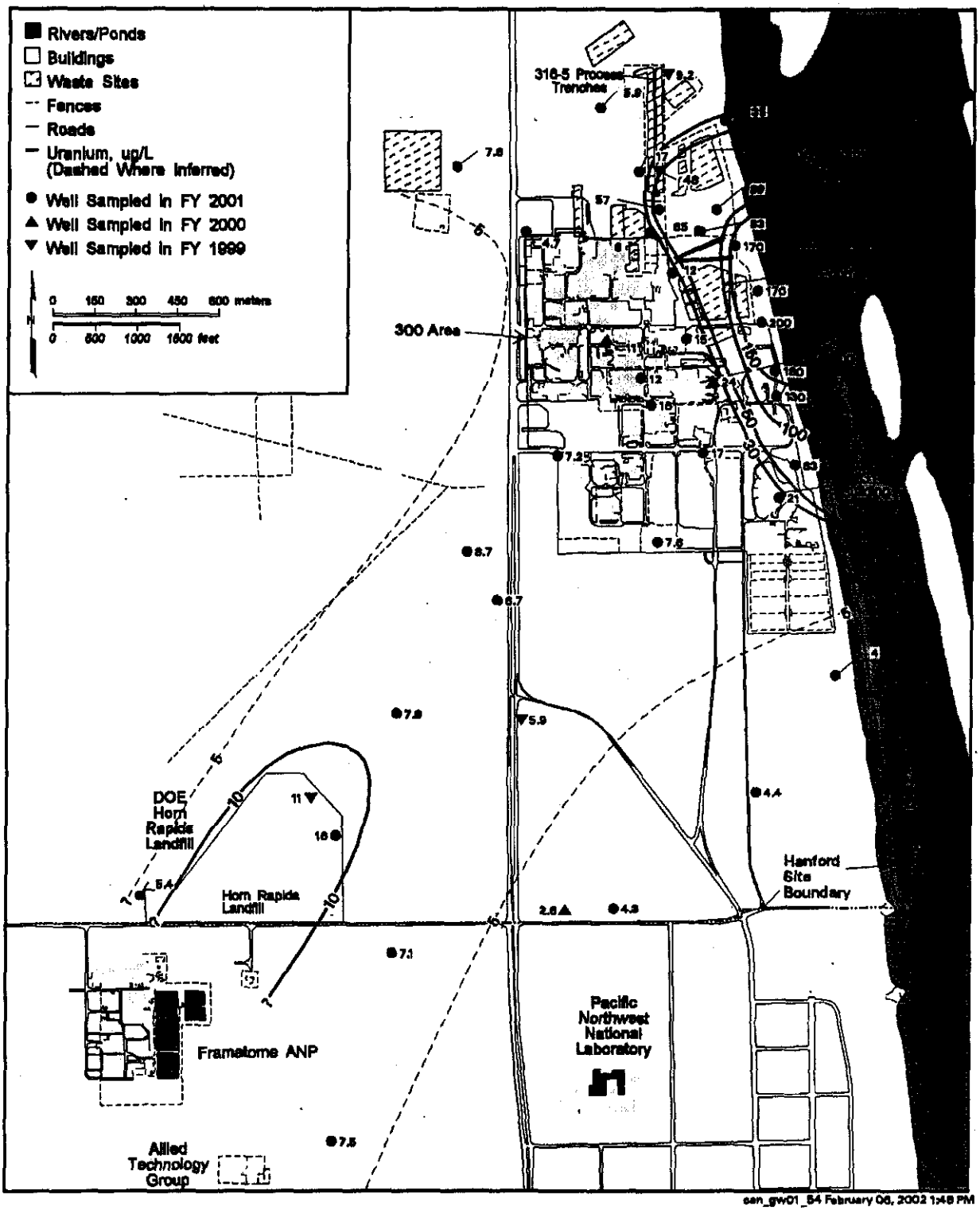

Figure 2. Uranium Concentrations in the 300 and Richland North Areas, Top of Unconfined Aquifer, August to September 2001 (from PNNL-13788).

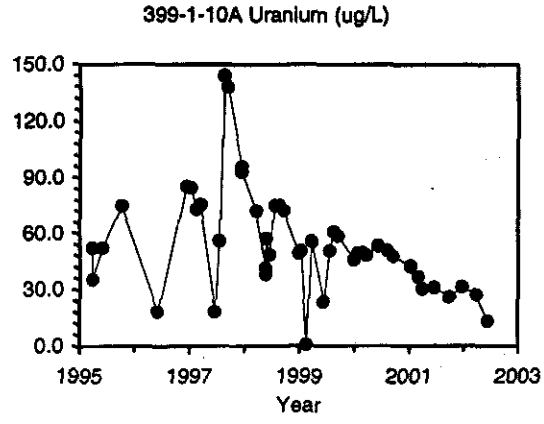

Figure 3. Uranium at Well 399-1-10A.

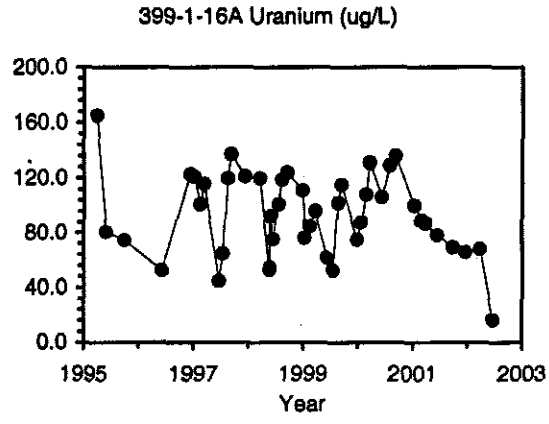

Figure 4. Uranium at Well 399-1-16A.

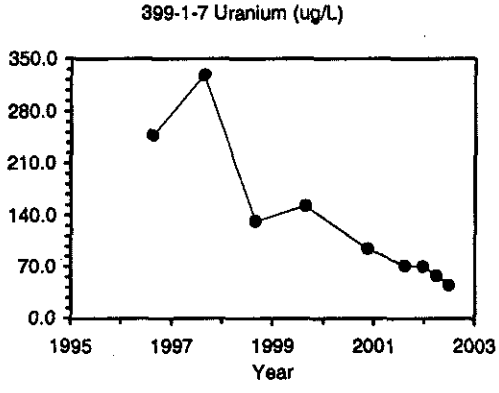

Figure 5. Uranium at Well 399-1-7.

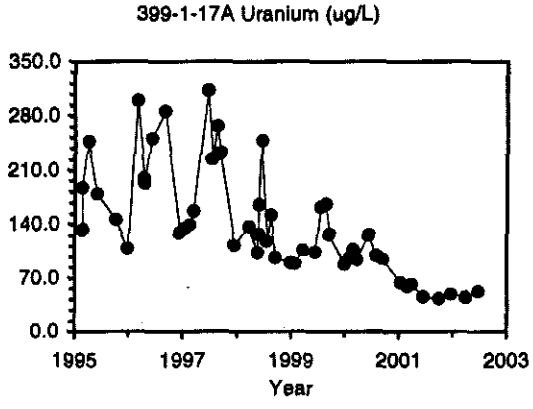

Figure 6. Uranium at Well 399-1-17A.

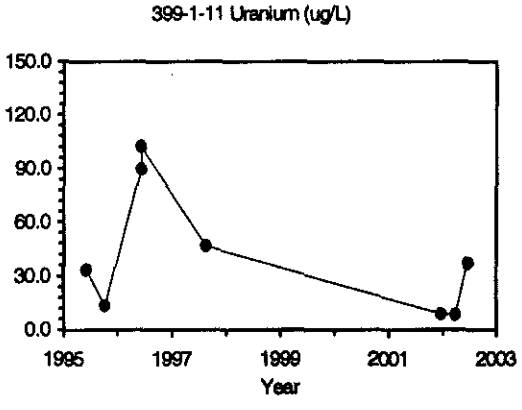

Figure 7. Uranium at Well 399-1-11.

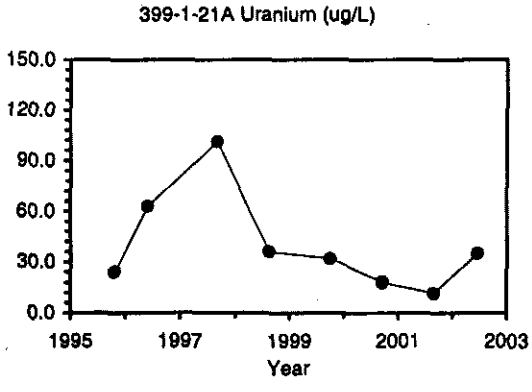

Figure 8. Uranium at Well 399-1-21A.

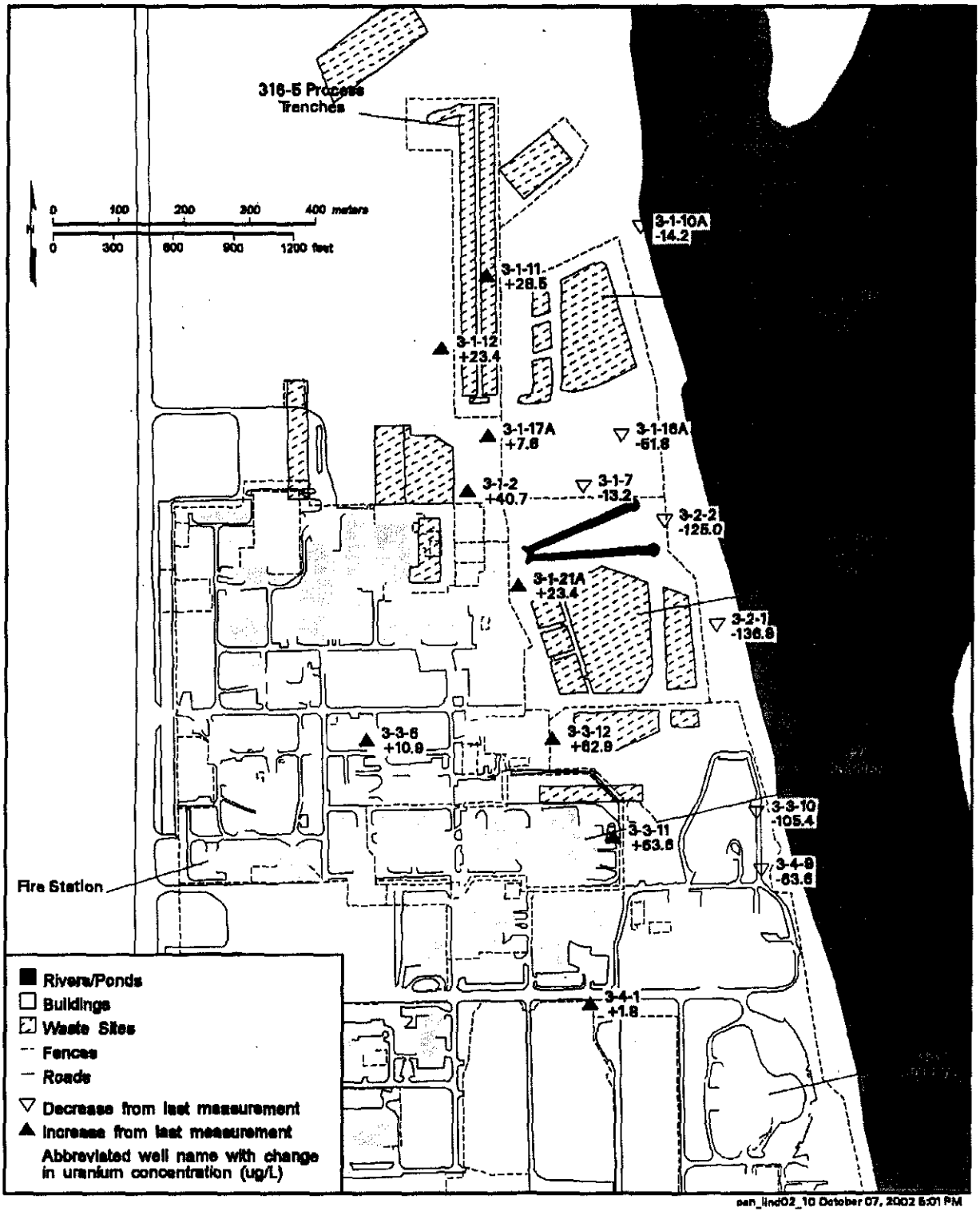

Figure 9. Net Change in Uranium Concentration Between June 2002 and Previous Measurement.

The decrease in uranium concentration in areas along the river is caused by dilution of groundwater with river water as river water flows westward and away from the river under the reversed gradient established during the high river stage. Consistent with this observation is a recent study (Serne et al. 2002) that reports that the mobility of uranium in river water (compared to groundwater) is lower. Conversely, Serne et al. (2002) also reports that uranium mobility in groundwater (with higher concentrations of calcium carbonate and bicarbonate) is higher. This could help explain the increased concentration of uranium in the June sampling event in areas further from the river. The higher-than-normal river stage in June 2002 allowed groundwater to enter what formally was the lower vadose zone and remobilize uranium sequestered there. The water table also rises along the river during high river stages, but the uranium mobility is decreased in the groundwater-river water mixtures, with the result of lower uranium concentration.

The earlier decision to decrease the sampling frequency of well 399-1-11 to semiannual (based on March 2002 sampling results) was reversed in June 2002 because the uranium concentration at that well increased from 8.4 in March 2002 to 36.9 μg/L in June 2002. The decision on a more permanent change for the sampling frequency at well 399-1-11 will be delayed until after additional data are gathered from future quarterly sampling events. The concentration of uranium continued to decrease in well 399-1-10A from March to June 2002 (27.4 to 13.2 μg/L), but that decrease in concentration is due to dilution by mixing groundwater with river water. Any decision for changing the sampling frequency at this well, too, will be delayed for future quarterly sampling events when high river stages are not affecting uranium concentration.

Cis-DCE (MCL 70 μg/L) was detected at two wells in the 300 APT well network during the current reporting period. Those two wells were 399-1-16B and 399-1-17B, which are screened at the bottom of the unconfined aquifer. The concentration at well 399-1-17B is detected at 1.4 μg/L but is only an estimate because the result was less than the practical quantitation limit but greater than method detection limit. The concentration at 399-1-16B was as high as 160 μg/L (June 17, 2002) during the reporting period, which is consistent with historical trends in this well (Figure 10). The concentrations do not appear to be directly affected by river stage as would be expected in wells screened at the water table. The overall trend in well 399-1-16B is highly variable, ranging from 100 to 190, but has remained in this range since 1997. The concentration of cis-DCE remains steady for one of two potential reasons. The first is that the groundwater flow rate at the bottom of the unconfined aquifer is very low such that the contamination has not

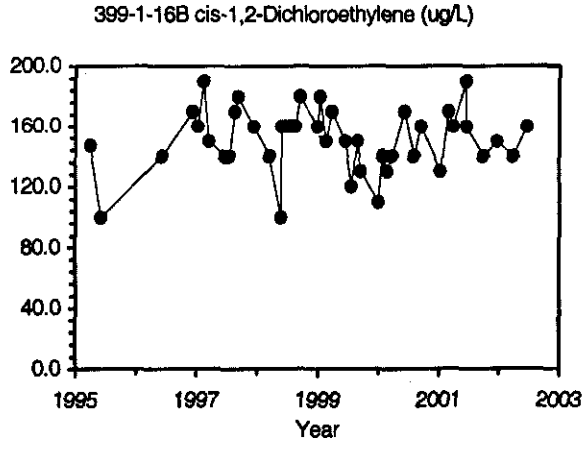

Figure 10. Cis-1,2-dichloroethene at Well 399-1-16B.

had sufficient time to move downgradient. The other potential reason is that there is a continuing supply of dissolved cis-DCE from a pool of immiscible cis-DCE (DNAPL) located near well 399-1-16B.

CONCLUSIONS

Concentrations of uranium and cis-DCE exceeded applicable concentration limits during the reporting period. Three wells exceeded the MCL for uranium in the March 2002 sampling event, and the results continued the previous steady to downward trend. However, the high river stage during the June 2002 sampling event disrupted the trends. Wells close to the river had decreased concentrations of uranium due to mixing of groundwater with river water. Wells further away from the river had increased levels of uranium due to an additional source of uranium from (what was formerly) the lower vadose zone. The only well showing a significant concentration of cis-DCE (well 399-1-16B) is screened at the base of the unconfined aquifer. The concentration of cis-DCE in this well appears to be holding steady as it has since 1997, and the concentration does not appear to fluctuate with changing river stage.

The Five-Year Review of the Hanford Site 300 Area National Priority List (U.S. EPA, 2001) indicated that, in general, the 300 Area cleanups are proceeding in a protective and effective manner. The EPA still considers the cleanup goals and remedy selection decisions in the record of decision (ROD 1996) appropriate at the present time. The results and conclusions of this semiannual report of groundwater contamination beneath the 300 APT are in general agreement with the conclusions of the EPA in the Five-Year Review.

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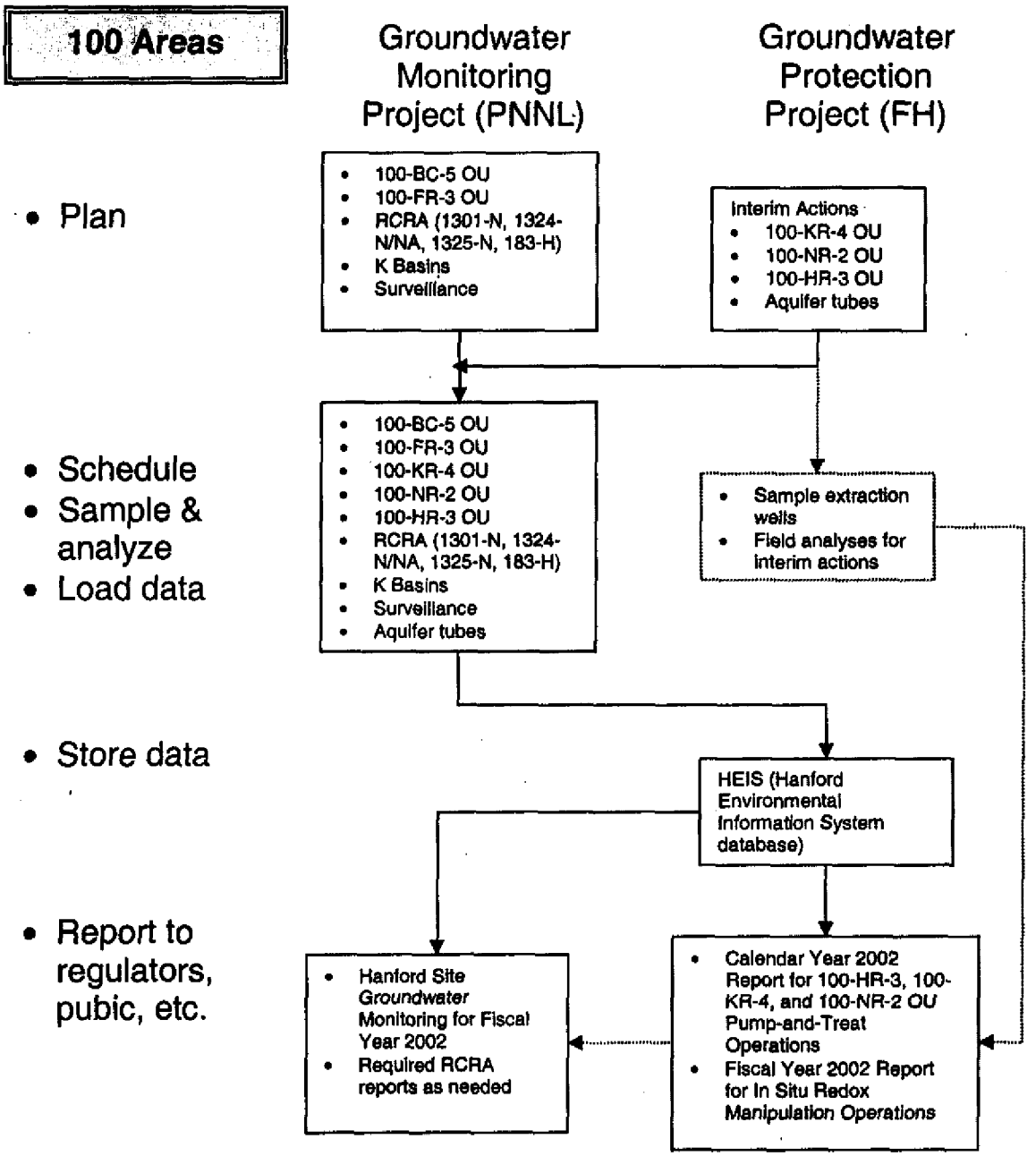
APPENDIX A
RESULTS FOR CONTAMINANTS OF INTEREST IN 300 AREA PROCESS TRENCHES WELLS DURING JANUARY-JUNE 2002

Well	Date	Result	Qualifier
cis-1,2-Dichloroethylene			
399-1-10A	3/25/2002	0.24	U
399-1-10A	6/14/2002	0.24	U
399-1-10B	6/20/2002	0.24	U
399-1-11	3/26/2002	0.24	U
399-1-11	6/17/2002	0.24	U
399-1-16A	3/25/2002	0.48	J
399-1-16A	6/20/2002	0.24	U
399-1-16B	3/25/2002	140	D
399-1-16B	6/17/2002	160	D
399-1-17A	3/26/2002	0.24	U
399-1-17A	6/20/2002	0.24	U
399-1-17A	6/20/2002	0.24	U
399-1-17B	6/17/2002	1.4	J
399-1-21A	6/17/2002	0.24	U
399-1-21B	6/24/2002	0.24	U
399-1-7	3/26/2002	0.24	U
399-1-7	6/24/2002	0.59	J
399-1-8	6/25/2002	0.24	U
Tetrachloroethene			
399-1-10A	3/25/2002	0.36	U
399-1-10A	6/14/2002	0.36	U
399-1-10B	6/20/2002	0.36	U
399-1-11	3/26/2002	0.36	U
399-1-11	6/17/2002	0.36	U
399-1-16A	3/25/2002	0.36	U
399-1-16A	6/20/2002	0.36	U
399-1-16B	3/25/2002	0.36	U
399-1-16B	6/17/2002	0.36	U
399-1-17A	3/26/2002	0.36	U
399-1-17A	6/20/2002	0.36	U
399-1-17A	6/20/2002	0.36	U
399-1-17B	6/17/2002	0.36	U
399-1-21A	6/17/2002	0.36	U
399-1-21B	6/24/2002	0.36	U
399-1-7	3/26/2002	0.36	U
399-1-7	6/24/2002	0.36	U
399-1-8	6/25/2002	0.36	U
Trichloroethene			
399-1-10A	3/25/2002	0.29	U
399-1-10A	6/14/2002	0.29	U
399-1-10B	6/20/2002	0.29	U
399-1-11	3/26/2002	0.29	U
399-1-11	6/17/2002	0.29	U

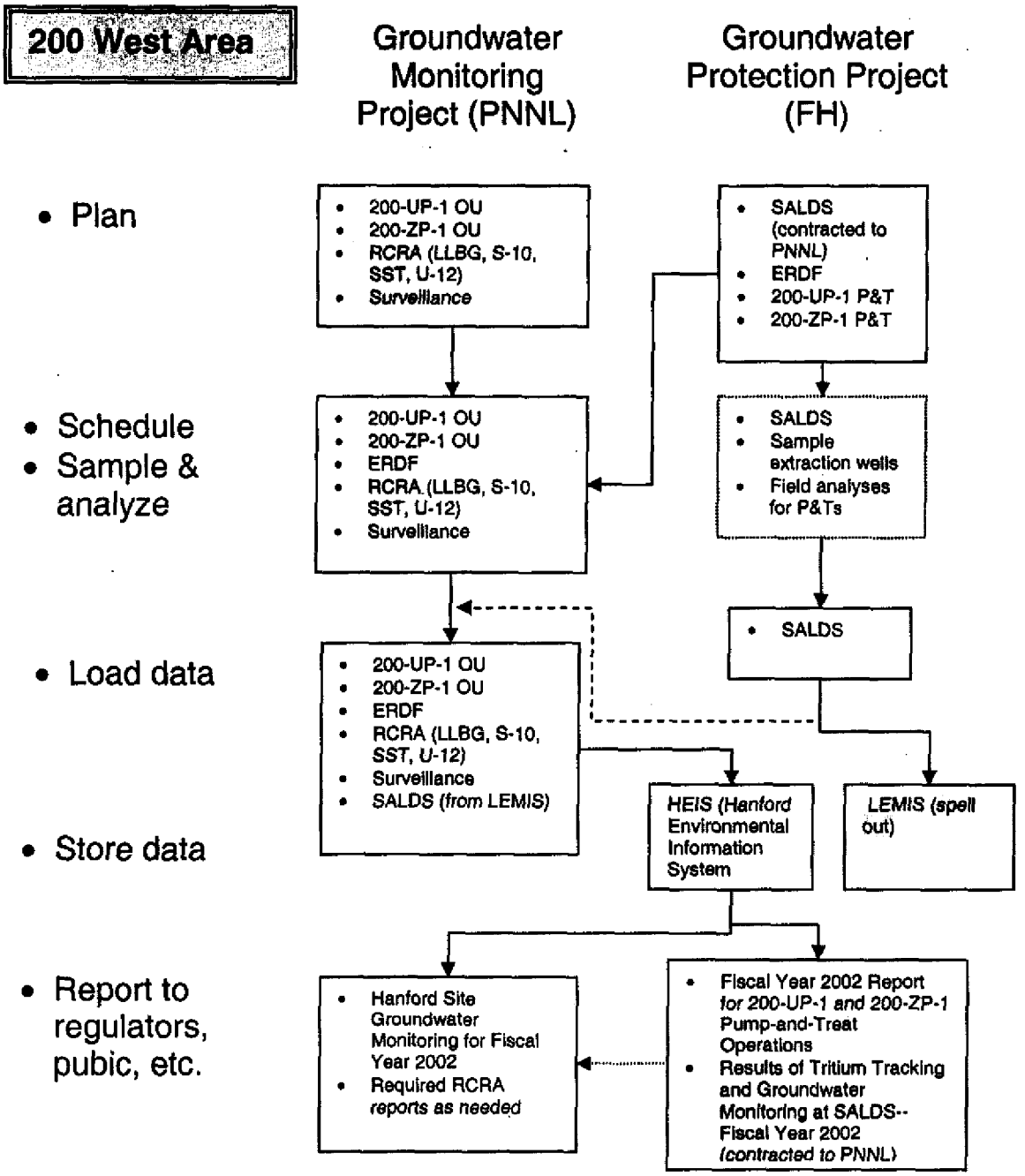
Well	Date	Result	Qualifier
399-1-16A	3/25/2002	0.57	J
399-1-16A	6/20/2002	0.29	U
399-1-16B	3/25/2002	2.4	J
399-1-16B	6/17/2002	2.6	J
399-1-17A	3/26/2002	0.46	J
399-1-17A	6/20/2002	0.34	J
399-1-17A	6/20/2002	0.36	J
399-1-17B	6/17/2002	0.29	U
399-1-21A	6/17/2002	0.96	J
399-1-21B	6/24/2002	0.29	U
399-1-7	3/26/2002	1.3	J
399-1-7	6/24/2002	2.3	J
399-1-8	6/25/2002	0.29	U
	Uranium		
399-1-10A	3/25/2002	27.4	
399-1-10A	6/14/2002	13.2	
399-1-10B	6/20/2002	0.103	
399-1-11	3/26/2002	8.44	
399-1-11	6/17/2002	36.9	
399-1-16A	3/25/2002	67.8	
399-1-16A	6/20/2002	16	
399-1-16B	3/25/2002	14.3	
399-1-16B	6/17/2002	14.1	
399-1-17A	3/26/2002	44.7	
399-1-17A	6/20/2002	52.5	
399-1-17A	6/20/2002	52.5	
399-1-17B	6/17/2002	0.57	
399-1-21A	6/17/2002	34.9	
399-1-21B	6/24/2002	0.305	
399-1-7	3/26/2002	58.1	
399-1-7	6/24/2002	44.9	
399-1-8	6/25/2002	1.06	

U = Concentration below detection limit.
J = Analysis indicated presence of compound that meets identification criteria, but result was less than practical quantitation limit and greater than zero.
D = Sample was diluted prior to analysis and result corrected.



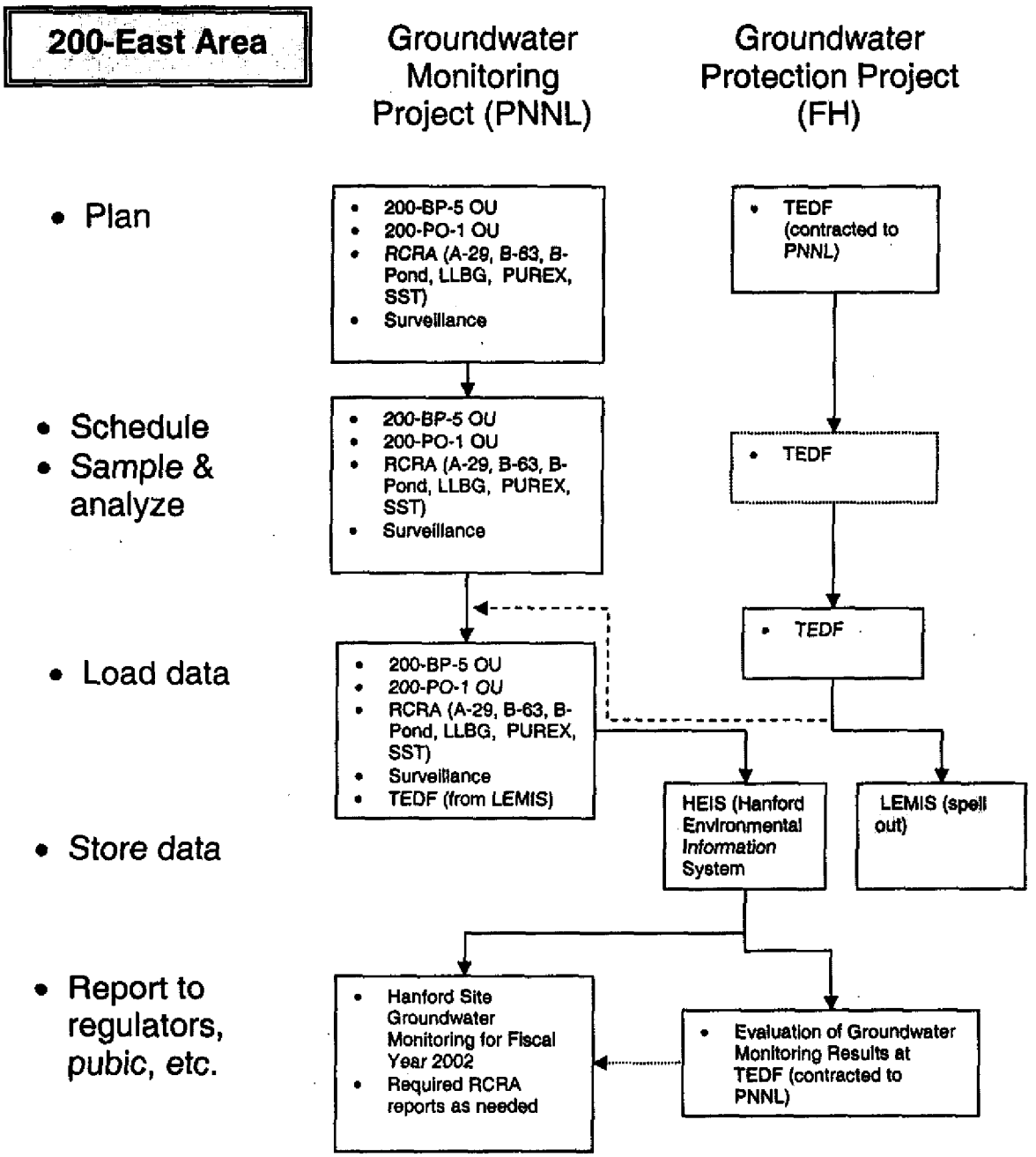
OU = operable unit
RCRA = Resource Conservation and Recovery Act of 1976
Solid arrows indicate primary information flow
Dashed arrows indicate secondary data flow

Figure 4.2. Responsibilities and Flow of Information for Groundwater Monitoring in the 100 Areas.



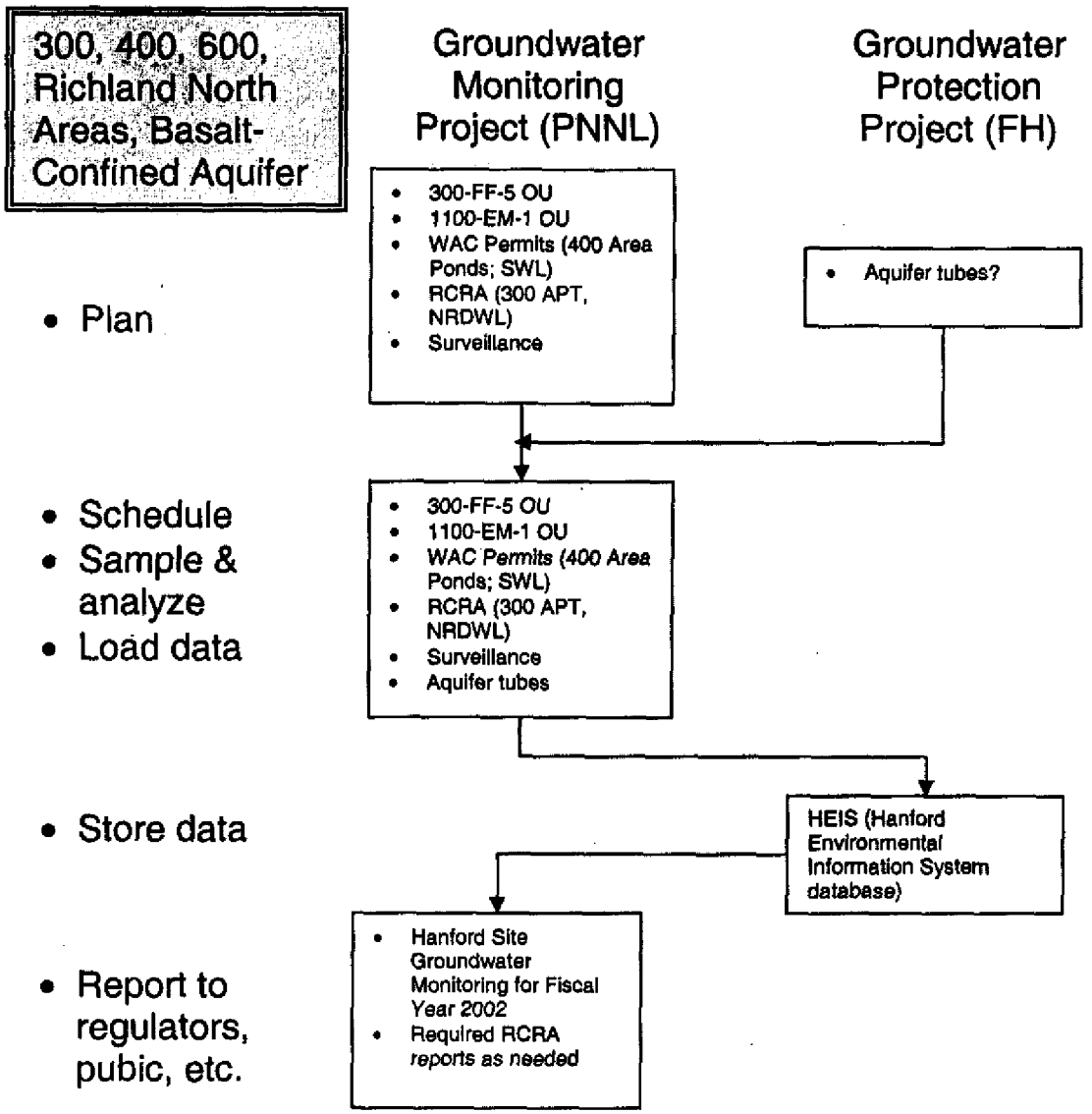
OU = operable unit
RCRA = Resource Conservation and Recovery Act of 1976
LLBG = Low-Level Burial Grounds (Waste Management Areas 3 and 4)
SALDS = State-Approved Land Disposal Site
SST = Single-Shell Tanks (Waste Management Areas S-SX, T, TX-TY, and U)
Solid arrows indicate primary information flow, Dashed arrows indicate secondary data flow

Figure 5.3. Responsibilities and Flow of Information for Groundwater Monitoring in the 200-West Area.



OU = operable unit
RCRA = Resource Conservation and Recovery Act of 1976
LLBG = Low-Level Burial Grounds (Waste Management Areas 1 and 2)
TEDF = Treated Effluent Disposal Facility
SST = Single-Shell Tanks (Waste Management Areas A-AX, B-BX-BY, and C)
Solid arrows indicate primary information flow, Dashed arrows indicate secondary data flow

Figure 6.2. Responsibilities and Flow of Information for Groundwater Monitoring in the 200-East Area.



300 APT = 300 Area Process Trenches
NRDWL = Nonradioactive Dangerous Waste Landfill
OU = operable unit
RCRA = Resource Conservation and Recovery Act of 1976
SWL = Solid Waste Landfill
Solid arrows indicate primary information flow

Figure 7.2. Responsibilities and Flow of Information for Groundwater Monitoring in the 300, 400, 600, and Richland North Areas and Basalt-Confined Aquifer.